What is claimed is:

1. An imaging system for imaging an object to an image plane, comprising:
an optical arrangement for forming an intermediate image of the object at an intermediate image plane with a first value of axial resolution;
a digital processor configured to process the intermediate image to form a final image of the given object at the image plane; and
one or more specially designed optical elements configured to cooperate with the optical arrangement and the digital processor to define a second value of axial resolution that is greater than the first value.

2. The imaging system of Claim 1 wherein the specially designed optical elements are disposed between the object and the intermediate image plane.

3. The imaging system of Claim 2, wherein the optical arrangement forms an exit pupil and wherein the specially designed optical elements are disposed adjacent to the exit pupil.

4. The imaging system of Claim 2, wherein the optical arrangement forms an exit pupil and an image of the exit pupil, and wherein the specially designed optical elements are disposed at the image of the exit pupil.

5. The imaging system of Claim 2, wherein the optical arrangement forms an aperture stop and wherein specially designed optical elements are disposed adjacent to the aperture stop.

6. The imaging system of Claim 2, wherein the optical arrangement forms an aperture stop and an image of said aperture stop at a predetermined location, and wherein the specially designed optical elements are disposed at the predetermined location.

7. The imaging system of Claim 1, wherein the specially designed optical elements comprise a random phase plate.

8. The imaging system of Claim 1, wherein the specially designed optical elements comprise a pseudo-random phase plate.

9. The imaging system of Claim 1, wherein the specially designed optical elements comprises a phase grating.

10. The imaging system of Claim 1, wherein the specially designed optical elements are configured to form a series of sinusoidal functions modifying a phase function of electromagnetic energy forming the intermediate image.

11. The imaging system of Claim 1, wherein the specially designed optical elements comprise at least one refractive element.

12. The imaging system of Claim 1, wherein the specially designed optical elements comprise at least one diffractive element.

13. The imaging system of Claim 1, wherein the specially designed optical elements is a single optical element.

14. The imaging system of Claim 13, wherein the single optical element comprises one or both of refractive and diffractive qualities.

15. The imaging system of Claim 13, wherein the specially designed optical elements comprise one or more optical surfaces.

16. The imaging system of Claim 13, the optical surfaces comprising at least one reflective surface.

17. The imaging system of Claim 13, the optical surfaces comprising at least one diffractive surface.

18. The imaging system of Claim 1, the intermediate image having a plurality of frequency components with amplitude characteristics, the specially designed optical elements attenuating the amplitude characteristics of certain of the frequency components, the digital processor being configured to amplify the amplitude characteristics of the certain frequency components.

19. The imaging system of Claim 1, the intermediate image forming a plurality of frequency components with phase characteristics, the specially designed optical elements perturbing phase characteristics of certain of the frequency components, the digital processor being configured to correct perturbed phase characteristics of the certain frequency components.

20. The imaging system of Claim 1, the optical arrangement forming a first depth of field, the specially designed optical elements and the digital processor cooperating to form a second depth of field that is less than the first depth of field.

21. In an imaging system for imaging an object to an image plane, the imaging system of the type having an optical arrangement configured to form an intermediate image of the object at an intermediate plane with a first depth of field, further comprising the improvement of a digital processor configured to process the intermediate image to form a final image of the object at the image plane, and an optical element configured to cooperate

with the optical arrangement and the digital processing arrangement to provide a second depth of field less than the first depth of field at the intermediate plane.

22. A method for reducing depth of field of an image of an object, comprising the steps of:

forming an intermediate image of the object at an intermediate plane by one or more optical elements defining a first depth of field;

perturbing a phase function of electromagnetic energy forming the intermediate image by a specially designed optical element; and

digitally processing the intermediate image to form a final image such that the one or more optical elements and the specially designed optical element define a second depth of field that is less than the first depth of field.

23. The method of Claim 22, the step of perturbing further comprising the step of positioning the specially designed optical element between the object and the image.

24. The method of Claim 23, the step of positioning further comprising the step of positioning the optical element adjacent to an exit pupil defined by the one or more optical elements.

25. The method of Claim 23, the step of positioning further comprising the step of positioning the optical element at an image of an exit pupil defined by the one or more optical elements.

26. The method of Claim 23, the step of positioning further comprising the step of positioning the optical element adjacent to an aperture stop defined by the one or more optical elements.

27. The method of Claim 23, the step of positioning further comprising the step of positioning the optical element at an image of an aperture stop defined by the one or more optical elements.

28. The method of Claim 22, the step of perturbing further comprising the step of utilizing a refractive element as the specially designed optical element.

29. The method of Claim 22, the step of perturbing further comprising the step of utilizing a diffractive element as the specially designed optical element.

30. The method of Claim 22, the step of perturbing further comprising the step of utilizing a random phase plate as the specially designed optical element.

31. The method of Claim 22, the step of perturbing further comprising the step of utilizing a pseudo-random phase plate as the specially designed optical element.

32. The method of Claim 22, the step of perturbing further comprising the step of utilizing a phase grating as the specially designed optical element.

33. The method of Claim 32, wherein the phase grating exhibits an in-focus PSF and an out-of-focus PSF, and wherein the phase grating is designed such that an angle between the in-focus PSF and the out-of-focus PSF is maximized in Hilbert space.

34. The method of Claim 22, the intermediate image forming a plurality of frequency components with amplitude characteristics, the specially designed optical element attenuating the amplitude characteristics of certain frequency components, the step of digitally processing further comprising the step of amplifying the amplitude characteristics.

35. The method of Claim 22, the intermediate image forming a plurality of frequency components with phase characteristics, the specially designed optical element perturbing the phase characteristics of certain of the plurality of frequency components, the step of digitally processing further comprising correcting the perturbed phase characteristics of the certain frequency components.

36. An imaging system for imaging an object to an image plane, comprising:

an optical arrangement configured to form an intermediate image of the object at an intermediate plane, the optical arrangement including one or more optical elements and a specially designed optical element; and

a digital processing arrangement configured to process the intermediate image to form (a) an in focus image of a first axial portion of the object and (b) an out of focus image of a second axial portion of the object.